UID Depot Implementation Study – Draft Results

Presented to: OSD

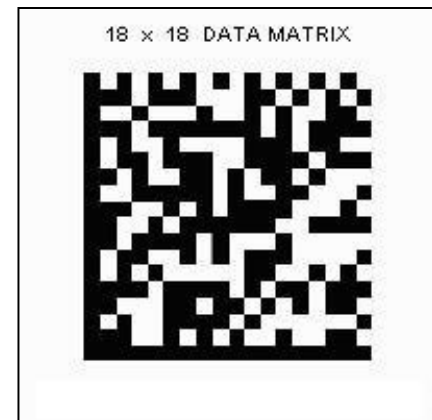## 22 April 2005

Rick Tillotson, Associate Research Engineer

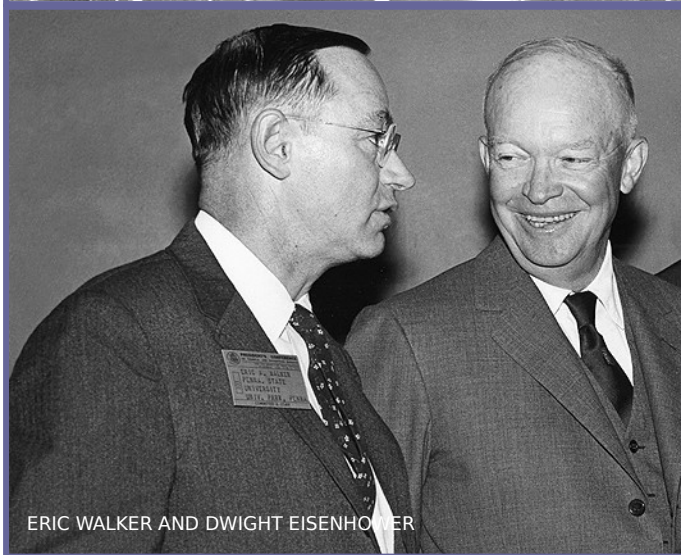**Applied Research Laboratory**

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18 x 18 DATA MATRIX

- **ARL Penn State**

- **The *UID Depot Implementation Study* Project**

- **Data Collection**

- **Assumptions**

- **Results**

- **Depot Implementation**

- **Summary**

TUNNEL CONSTRUCTION 1949

ERIC WALKER AND DWIGHT EISENHOWER

- U.S. Navy established the Applied Research Laboratory at Penn State in 1945

    – Eric Walker, first Director (1945-51) and Penn State President (1956-70)
    – Intercollege Graduate Degree Program in Acoustics established in 1965

- In 1996, Navy reaffirmed its strategic relationship and commitment by designating ARL as a University Affiliated Research Center (UARC)

- ARL faculty and staff provide technical leadership in the DoD for our areas of expertise. Additionally, we educate the next generation of scientists and engineers for the Naval workforce

- ARL is the largest research unit within Penn State with more than 1,000 faculty and staff. Primary organizational focus is on

As a University-Affiliated Research Center (UARC) ARL Penn State…

"…maintains a special long-term strategic relationship with Navy/DoD."

Characteristics of this relationship include:

- **Responsive to evolving needs**
- **Comprehensive knowledge of needs and problems**
- **Access to information and proprietary data**
- **Corporate knowledge and technical memory**
- **Objectivity and independence from commercial interests**
- **Quick response capability**
- **Current operational experience**

VEHICLE FIELD EXERCISE

GARFIELD THOMAS WATER TUNNEL

STUDENT RESEARCH

4 of 32

- Sponsor: Navy's Repair Technology (REPTECH) Program
  - Sponsor: Greg Woods, ONR MANTECH, WoodsG@onr.navy.mil

  REPTECH Advisory Board, aka "Working Group"
  - NAVSEA: Kurt Doehnert, SEA 04X2E, DoehnertKC@navsea.navy.mil
  - NAVAIR: Dale Rizzolo, AIR 3.1.4, Dale.Rizzolo@navy.mil
  - USMC: Mischa Sharpe, USMC Logistics Command, SharpeMC@logcom.usmc.mil
  - PSU ARL: Sean Krieger, slk22@psu.edu

UID Depot Implementation Study: Depot Needs

- To identify the steps that organic depot maintenance activities will have to take to prepare for and carry out the UID policy

- To estimate the start-up cost of implementing UID at the depots

- To estimate the on-going costs of UID implementation at the depots

- To identify issues affecting the depots' ability to implement UID effectively

6 of 32

UID Depot Study Project

- Project PI: Rick Tillotson
- Objective: Perform an assessment of the effort and funding required to implement UID at Navy and Marine Corps organic depot maintenance activities
- Shop floor perspective
- Duration: 10 months (Mar. 1, 2004 – Dec. 31, 2004)
- Funding: $ 75K
- Deliverables:
  - Recommended UID implementation steps
  - Estimated costs of UID implementation
  - Timeline for UID implementation
  - Identification of any outstanding implementation issues

UID Depot Study Project – Approach

- Conduct the study at 4 "representative" depots
  - Collect data at each site
  - Use data to estimate implementation costs
  - Brief management at each site on results
- Include all UID-qualifying items at each depot
  - Maintenance workload
  - Industrial plant equipment & test/support equipment
- Do not include non-discrete or non-maintenance items
  - Infrastructure/Pre-fab
  - Batch products
  - Buildings
  - Office equipment
- Estimate costs of implementation incurred by depots
  - Nonrecurring costs
  - Recurring costs

Sites Covered by Study:

- NAVSEA
  - Norfolk NSY
  - Portsmouth NSY
  - Pearl Harbor NSY
  - Puget Sound NSY
  - NUWC Keyport (depot)
  - NSWC Crane (depot)

- NAVAIR
  - NADEP Cherry Point
  - NADEP Jacksonville
  - NADEP North Island

- USMC
  - MCLB Albany
  - MCLB Barstow

Sites visited

UID Depot Study Project – Scope

1. Specify which parts need UID
2. Specify where on a part to apply UID symbol
3. Specify how big to make the UID symbol
4. Specify the UID construct for an enterprise doing marking
5. Specify the marking technology to use for each part
6. Revise drawings for all affected items
7. Specify when and how UID data is to be used
8. Specify what data is to be collected along with UID
9. Determine if existing databases or information systems need to be modified or new ones need to be developed to accommodate UID data
10. Select and procure marking and reading equipment
11. Train personnel
12. Develop marking, reading, and data entry procedures or modify existing procedures to accommodate UID data collection
13. Prior to marking, generate the specific UID character string for a part
14. Apply UID marks to outgoing items
15. Read UID marks on incoming items
16. Enter UID data into information systems

Depot responsibilities in scope of study

- **Nonrecurring costs**
  - UID equipment: markers, readers, verifiers
  - Static documents, procedures, work instructions, drawings
  - Initial employee training
  - Marking existing test/support/industrial plant equipment
- **Recurring costs**
  - UID equipment maintenance: preventive maintenance, consumables, repair & replacement
  - New documents, procedures, work instructions, drawings
  - Refresher employee training
  - Marking new test/support/industrial plant equipment
  - Depot maintenance workload: marking, reading, verifying, data entry

Definitions:

- UID-Qualifying Item: an item that meets any of the criteria for requiring a UID symbol (acquisition cost > $5K, serially-managed, mission essential, etc.)

- End Item: a UID-qualifying item from a customer that enters the depot for maintenance and is later shipped back to the customer

- Embedded Item: a UID-qualifying item that enters the depot as part of an end item, is removed during disassembly, is handled individually, and may be later reassembled back into a different end item

- UID-Damaging Operation: a depot maintenance process that has the potential to damage or degrade a UID symbol on an item to the extent that the symbol is unreadable
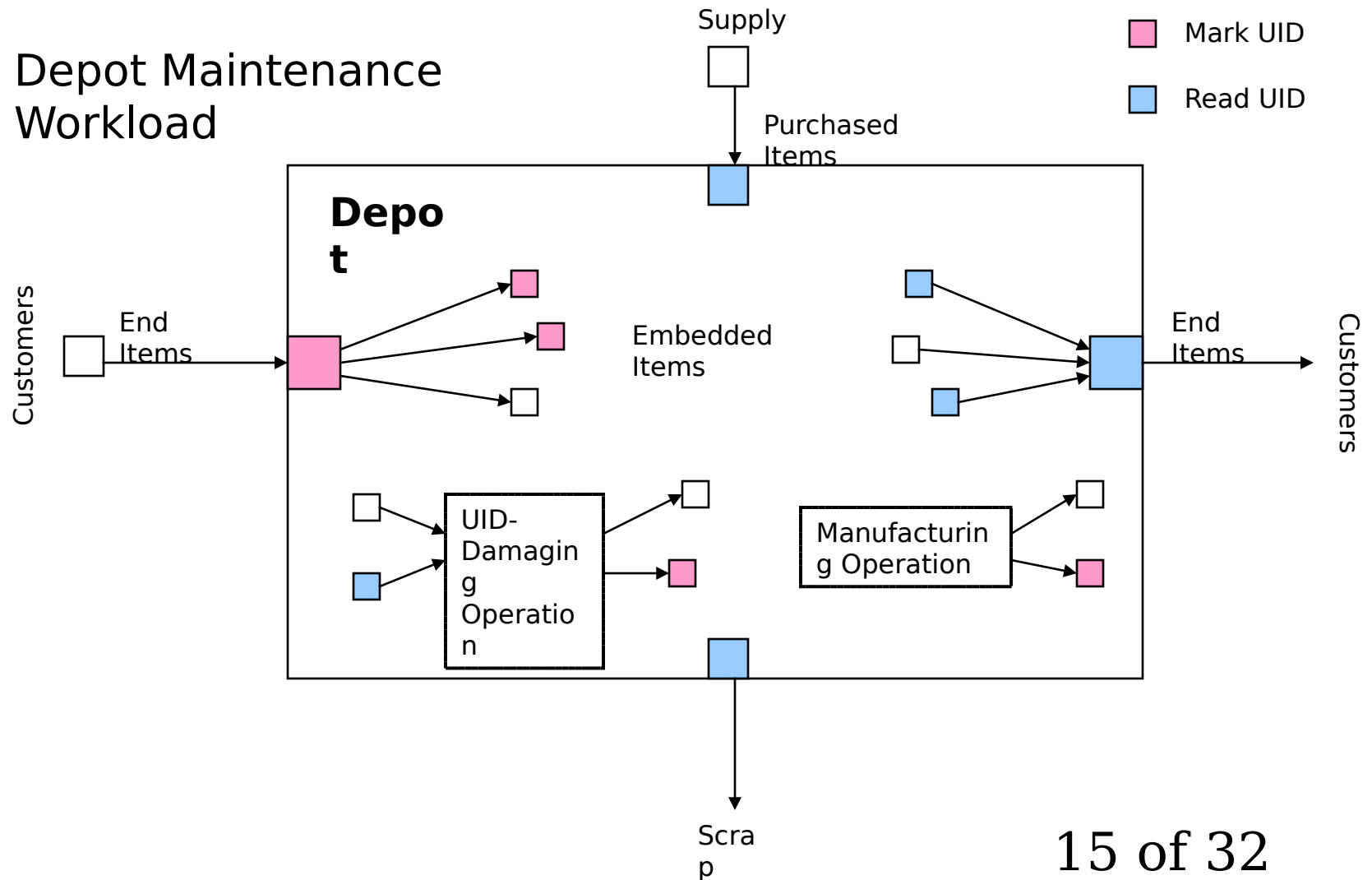
Depot Maintenance Tasks that Will Involve UID:

- Receiving
- Shipping
- Disassembly
- Re-assembly
- Manufacturing (from raw stock)
- Abrasive cleaning, blasting, grinding, plating
- Scrap

Data Collected at each Depot:

- UID Equipment – how many marking stations, readers, verifiers; where should they be located

- Documents, Procedures, Drawings – how many; how long to write/revise each

- Training – how many people to be trained in marking; how many to be trained in reading UIDs

- Test/support/industrial plant equipment – how many existing pieces; how many new pieces per year

- Depot maintenance workload – how many UID-qualifying items enter, leave, are embedded, purchased, manufactured, scrapped, or go through UID-damaging operations

14 of 32

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Depot Maintenance Workload

Supply

Purchased Items

Mark UID
Read UID

Depot

Customers

End Items

Embedded Items

End Items

Customers

UID-Damaging Operation

Manufacturing Operation

Scrap

15 of 32

1. UID-qualifying purchased items entering the depot will have already been marked

2. UID-qualifying items entering the depot as part of normal maintenance workload will need to be marked

3. All marking stations contain the same set of equipment

4. Marking stations will be located wherever the items to be marked are normally worked on

5. All UID readers are high-reliability, low-contrast readers

6. UID requirements, documentation, and funding will be in place to allow the depots to carry out their UID-related tasks

7. Depot personnel perform all UID-related tasks

Nonrecurring Costs *

Category	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY
Equipment	$1,718,000	$ 5,447,000	$3,677,000	$ 8,866,000
Documentation	24,000	11,627,600	120,000	169,600
Training	209,200	699,400	250,800	996,000
IPE	16,500	139,627	18,755	95,572
	$1,967,700	$17,913,627	$4,066,555	$10,127,172

Annual Recurring Costs *

Category	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY
Equipment	$143,200	$ 453,800	$ 317,550	$ 796,650
Documentation	0	0	0	15,545,600
Training	41,840	139,880	50,160	199,200
IPE	183	7,350	1,082	22,183
Workload	386,024	3,349,823	3,449,908	63,230
	$571,248	$3,950,853	$3,818,700	$16,626,863

* DRAFT: Data being reviewed by SYSCOMs

Marking Station:
- Laser etch machine $100,000
- Dot peener $ 26,000
- Chemical etch $ 7,000
- Inkjet marker $ 35,000
- Verifier $ 10,000
- Cart $ 30,000

    TOTAL $208,000

UID Reader:
- 2D bar code imager $4,000
- Hand-held PC $1,000

    TOTAL $5,000

Lab-type Verifier:
- 2D bar code imager $ 5,000
- Light source $ 1,000
- Lens $ 1,000
- Stand/fixture $ 1,000
- PC $ 2,000

    TOTAL $10,000

18 of 32

- Laser Etch Machine: Telesis Model Zenith 20F, Monode Model Pinnacle 10W3P/M
- Chemical Etch Machine: Monode Model 7300
- Inkjet Marking Machine: JETEC Flex-A-JET Model 8400
- Dot Peener: Telesis Pinstamp Model TMP6100, Monode Model C151AZ
- UID Reader: RVSI Model MXi, Cognex Model DataMan 6500
- Hand-held Computer: Intermec Model CK31G
- Verifier: Webscan TruCheck Model 401
- Lab-type Verifier: Cognex Model In-Sight 5410, RVSI Model MVi or HawkEye

	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY
Buildings	6	13	16	24
Marking Stations	6	19	14	37
Readers	92	297	151	232
Lab-type Verifiers	1	1	1	1

- Preventive Maintenance & Consumables
  - Reader: $0/yr
  - Verifier: $0/yr
  - Marking station: $9,550/yr
    - Laser etch machine: $0/yr
    - Dot peener: $350/yr
    - Chemical etch: $4,500/yr
    - Inkjet marker: $4,700/yr

- Repair & Replacement: 5% of purchase price per year
  - Marking Station: 5% x $208K = $10.4K/yr
  - Reader: 5% x $5K = $250/yr
  - Verifier: 5% x $10K = $500/yr

	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY
Static Documents	15	29,069	300	106
Time to Revise Static Document (man-days)	2	½	½	2
New Documents	0	0	0	9,716
Time to Revise New Document (man-days)	--	--	--	2

Labor rate: $100/hr

- Initial Training: Part Marking
  - Class: 5 days, $6K/class, 6 people max.
  - Employee time: $100/hr per person while in class

- Initial Training: UID Verifying
  - Class: 2 days, $2K/class, 20 people max.
  - Employee time: $100/hr per person while in class

- Initial Training: UID Reading
  - 2 hrs, internal trainer
  - Employee time: $100/hr per person while in class

- Refresher Training
  - Cost: 20% x Initial Training (per year)

	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY
UID Marking	14	40	28	111
UID Verifying	14	40	28	111
UID Reading	554	2,147	300	1,242

	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY
Existing IPE	900	5,984	1,023	5,213
New IPE Purchased (per yr)	10	225	44	171
New IPE Manufactured (per yr)	0	90	15	1,039
Labor Time to Mark One Piece of Equipment (minutes)	11	14	11	11

Labor rate: $100/hr

Results – Annual Workload Quantities

	MC Barstow	NADEP Cherry Pt	NUWC Keyport	Norfolk NSY *
End Items	9,298	53,436	25,655	1,900
Embedded Items	6,575	26,672	115,200	500
Purchased Items	814	34,108	660	500
Manufactured Items	0	5,115	2,900	100
Scrapped Items	814	3,363	635	86
UID-damaged Items	0	2,600	300	40

* Data for NNSY is for non-nuclear items only

UID Marking Time (minutes):

Step	End Items, Embedded Items, Manufactured Items, IPE	UID-damaged Items
1. Retrieve documentation	2	2
2. Enter machine settings	1	1
3. Generate serial number (UID)	0.5	0.5
4. Fixture part	4	4
5. Mark part	1	1
6. Verify UID	0.5	0.5
7. Enter data	2	0
Note: For NADEP Cherry Point, add 3 minutes to Step 1. and Total	11 minutes	9 minutes

UID Reading Time (minutes):

Step	End Items, Scrapped Items, UID-damaged Items	Embedded Items	Purchased Items
1. Retrieve documentation	2	2	2
2. Read UID	0.5	0.5	0.5
3. Read UID of next higher assembly	0	0.5	0
4. Enter data	0.5	0.5	2
	3 minutes	3.5 minutes	4.5 minutes

Note: For NADEP Cherry Point, add 3 minutes to Step 1. and Total

28 of 32

- Obtain UID Equipment
- Train Personnel
- Write/revise documents to include UID
- Start marking UIDs on items, reading UIDs on items, and entering UID data

1. Plan how you will apply UID marks to depot-manufactured items
   - Keep in touch with customers regarding UID requirements
   - Keep in touch with ISEA's regarding UID specs
2. Plan how you will receive UID-marked parts from suppliers
   - See www.acq.osd.mil/dpap/UID/DataSubmission.htm
   - Wide Area Work Flow (WAWF): www.wawftraining.com, wawf.eb.mil
   - Keep in touch with suppliers regarding deliveries of UID-marked parts
3. Plan how you will mark plant property
4. Start small – do a pilot implementation in one area first
5. When procuring UID equipment, use DoD AIT contracts where applicable
6. For UID part marking, consider using a part-marking service provider
7. Stay abreast of emerging/changing UID policies
8. Participate in UID meetings & workshops
   - UID Maintenance IPT: www.acq.osd.mil/log/logistics_materiel_readiness/organizations/mppr/html/UID_IPT.htm
9. Appoint a UID POC

- Funding
- Schedule
- Alignment of policies, programs, and business rules across all participants in UID
- Identification and analysis of items to be UID'd
- Reprogramming and linking of affected AISs
- No wireless data collection due to NMCI
- How to handle incoming unreadable UIDs
- Database errors discovered at depots
  - Depots will be expected to correct data entry mistakes accumulated during item's lifetime
  - How to trace, correct database errors
- Using UID marking/scanning equipment in non-factory settings
  - Tight spaces
  - Hazardous environments
  - Remote locations
  - Poor lighting
  - Uncontrolled conditions

- **The *UID Depot Implementation Study* was a short-term project intended to estimate the costs and identify the hurdles facing UID implementation at Navy and Marine Corps organic depots and shipyards**

- **Data collection and analysis completed January 2005; final report to be issued 1 June 2005**